AMENDMENTS TO THE CLAIMS

The present listing of claims replaces all prior versions and listings of claims in the subject patent application.

Claim 1 (currently amended): An apparatus for measuring the level of a liquid having a surface in contact with a gas in a container, which comprises in combination:

(a) a transducer in physical contact with the outside of a wall of the container located below the surface of the liquid for generating at least two acoustic resonance responses in the liquid substantially perpendicular to the surface;

(b) a sweep generator for electrically exciting said transducer over a chosen range of acoustical frequencies and having a chosen waveform; and

(c) a receiver for measuring the acoustic frequencies for at least two resonant responses, whereby the level of the liquid is determined from the frequency difference between the frequencies of the resonant responses.

Claim 2 (original): The apparatus for measuring liquid level in a container as described in claim 1, wherein the chosen waveform comprises a sine wave.

Claim 3 (original): The apparatus for measuring liquid level in a container as described in claim 2, wherein the at least two resonant responses are analyzed by Fast Fourier Transform procedures.

Claim 4 (original): The apparatus for measuring liquid level in a container as described in claim 1, wherein the chosen range of acoustical frequencies includes at least one acoustic wall resonance.

Claim 5 (currently amended): The apparatus for measuring liquid level in a container as described in claim 1, wherein the chosen waveform comprises a continuous frequency modulated waveform voltage excitation, $V(t)$, having the form: $V(t) = \sin\left(2\pi\left(f_o + \frac{1}{2}\alpha t\right)t\right)$, where t is the time, f_0 is the initial frequency of the

swept waveform, and α is related to the rate of change of the instantaneous frequency, whereby a time-dependent response is produced in the liquid from which the liquid level is determined.

Claim 6 (currently amended): An apparatus for measuring the level of a liquid having a surface in contact with a gas in a container, which comprises in combination:

(a) means in physical contact with the outside of a wall of the container located below the surface of the liquid for generating at least two acoustic resonance responses in the liquid substantially perpendicular to the surface, and for determining the acoustic frequencies of at least two resonant responses; and

(b) means for electrically exciting said means for generating at least two acoustic resonance responses over a chosen range of acoustical frequencies and having a chosen waveform, whereby the level of the liquid is determined from the frequency difference between the frequencies of the resonant responses.

Claim 7 (original): The apparatus for measuring liquid level in a container as described in claim 6, wherein said means for generating at least two acoustic resonance responses and for determining the acoustic frequencies of at least two resonant responses comprises an acoustic transducer and an acoustic receiver.

Claim 8 (original): The apparatus for measuring liquid level in a container as describe in claim 6, wherein said means for electrically exciting said means for generating at least two acoustic resonance responses comprises a sweep generator.

Claim 9 (original): The apparatus for measuring liquid level in a container as described in claim 6, wherein the chosen waveform comprises a sine wave.

Claim 10 (original): The apparatus for measuring liquid level in a container as described in claim 9, wherein the at least two resonant responses are analyzed by Fast Fourier Transform procedures.

Claim 11 (original): The apparatus for measuring liquid level in a container as described in claim 6, wherein the chosen range of acoustical frequencies includes at least one acoustic wall resonance.

Claim 12 (currently amended): The apparatus for measuring liquid level in a container as described in claim 6, wherein the chosen waveform comprises a continuous frequency modulated waveform voltage excitation, $V(t)$, having the form: $V(t) = \sin\left(2\pi\left(f_o + \frac{1}{2}\alpha t\right)t\right)$, where t is the time, f_0 is the initial frequency of the swept waveform, and α is related to the rate of change of the instantaneous frequency, whereby a time-dependent response is produced in the liquid from which the liquid level is determined.

Claim 13 (currently amended): A method for measuring the level of a liquid having a surface in contact with a gas in a container, which comprises the steps of:

a. generating at least two acoustic resonances in the liquid substantially perpendicular to the surface of the liquid; and

b. determining the frequency of at least two acoustic resonances, whereby the level of the liquid is determined from the frequency difference between the frequencies of the acoustic resonances.

Claim 14 (original): The method for measuring liquid level in a container as described in claim 13, wherein the acoustic resonances are generated using a waveform comprising a sine wave.

Claim 15 (original): The method for measuring liquid level in a container as described in claim 14, wherein the sine wave is swept over frequencies comprising

at least one acoustic wall resonance of a wall of the container perpendicular to the surface of the liquid.

Claim 16 (currently amended): The method for measuring liquid level in a container as described in claim 13, wherein the acoustic resonances are generated using a waveform comprising a continuous frequency modulated waveform voltage excitation, $V(t)$, having the form: $V(t) = \sin\left(2\pi\left(f_o + \frac{1}{2}\alpha t\right)t\right)$, where t is the time, f_0 is the initial frequency of the swept waveform, and α is related to the rate of change of the instantaneous frequency, whereby a time-dependent response is produced in the liquid from which the liquid level is determined.

Claim 17 (currently amended): An apparatus for measuring the level of a liquid having a surface in contact with a gas in a container, which comprises in combination:

(a) a transducer in physical contact with the outside of a wall of the container located below the surface of the liquid for generating acoustic resonance responses in the liquid substantially parallel to the surface;

(b) a generator for electrically exciting said transducer; and

(c) a receiver for detecting the presence of resonant responses from the liquid, whereby if no resonant responses are detected, the level of the liquid is below said transducer.

Claim 18 (currently amended): An apparatus for measuring the level of a liquid having a surface in contact with a gas in a container, which comprises in combination:

(a) means in physical contact with the outside of a wall of the container located below the surface of the liquid for generating acoustic resonance responses in the liquid substantially parallel to the surface, and for detecting resonant responses; and

(b) means for electrically exciting said means for generating acoustic resonance responses, whereby if no resonance responses are detected, the level of the liquid is below said means for detecting resonant responses.

Claim 19 (currently amended): An apparatus for measuring the level of a liquid having a surface in contact with a gas in a container, which comprises in combination:

(a) means in physical contact with the outside of a wall of the container located below the surface of the liquid for generating acoustic resonance responses in the liquid substantially parallel to the surface;

(b) means for electrically exciting said means for generating acoustic resonance responses; and

(c) means for detecting the presence of resonant responses from the liquid, whereby if no resonant responses are present, the level of the liquid is below said means for detecting the presence of resonant responses.

Claim 20 (currently amended): A method for measuring the level of a liquid having a surface in contact with a gas in a container, which comprises the steps of:

(a) generating at least two acoustic resonances in the liquid substantially parallel to the surface of the liquid; and

(b) detecting the presence of acoustic resonances from the liquid, whereby if no acoustic resonances are detected, the level of the liquid is below a location where said step of generating at least two acoustic resonances in the liquid can be performed.